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On Linnaeus' (1764) butterfly type materials missing from the Museum of Evolution of Uppsala University (Section of Zoology) and the case of *Papilio hermione*

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Abstract. We briefly analyse the history of Queen Ulrika's and of Linnaeus' butterfly collections. We show that the type materials of some species were likely moved from Queen Ulrika's to Linnaeus' collection before 1803. We provide evidence that Honey and Scoble (2001) correctly designated the lectotypes of 101 of the 159 species listed in Linnaeus' (1764) publication. We likewise conclude that, although it did not respect of the prevailing concept of the species, the lectotype of *Papilio hermione* was validly designated by Kudrna (1977); consequently, the neotype of *P. hermione* designated by Russell and Vane-Wright (2024) is invalid.

The exact typification of species described by ancient authors has always represented a challenge for modern taxonomists. The generally very synthetic descriptions accompanying each binomen are frequently open to subjective interpretations and references to the illustrations published by pre-Linnean authors are often contrasting and unreliable. The original type materials, when traceable, or at least their accurate illustrations, represent therefore the primary source of information. In this paper we will try to untangle some of the problems concerning the typification of species described by Linnaeus in 1764 (Museum Ludovicae Ulrikae).

Linnaeus' descriptions (1764)

In the "Praefatio" to this work, Carl Linnaeus clearly stated that it represents a catalogue of the insects and 'shells' preserved in the private Museum of Ludovica [i.e. Lovisa] Ulrika, Queen of Sweden, of which Carl Alexander Clerck had accepted to illustrate [part of] the Lepidoptera (Clerck 1759, 1764, and unpublished).

Linnaeus (1764, pp. 181–340) listed in this volume 159 species, 123 of which (77%) had been already described in 1758 (Systema naturae ed. x) and six (4%) in 1763 (Centuria Insectorum), whilst the remaining 30 (19%) were published as new.

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The MLU collection

King Gustav [IV] Adolph, observing that after his grandmother's death (1782) the museum was not anymore adequately curated, bequeathed her collection to the Uppsala University in 1803 (Thunberg 1804). It is therefore certain that at least the syntypes of the species described as new by Linnaeus in 1764 (see below) were originally in the Royal Palace of Drottningholm (Stockholm), whilst those still surviving would be expected to be now housed in the section of Zoology of the Museum of Evolution of Uppsala University (UUZM); however, the situation is not as simple as that.

King Gustav Adolph had good reasons to be worried about the future of the collection. Thunberg (1804: 8–9), asked to draw a catalogue of the still extant specimens, was able to find materials of only 84 (53%) of the 159 butterfly species listed by Linnaeus in 1764, whilst Wallin [1994] found 85. Reasons for the discrepancy are that Wallin had found specimens of 'panthous' and 'patroclus' among those pertaining to Gustav IV Adolf's bequest, which were apparently overlooked by Thunberg, whilst the latter author had found at least one individual of 'alimena' not anymore present in the collection in the early years of the twentieth century].

Clerck's (1759, 1764) 'Icones Insectorum rariorum' (revised by Aurivillius 1882) are other important sources of information, adding the (generally) accurate, coloured illustrations of 78 species (26 of which not listed by Thunberg or Wallin), whilst the illustrations of an additional 17 species (8 of which 'lost') remained unpublished and often still uncoloured because of Clerck's premature death, aged 55 (1765). Some of the unpublished drawings are appended as six additional plates to the end of the second volume of Clerck's work available on the 'Gallica' internet site (see References) and all are preserved at the Center for History of Science of the Royal Swedish Academy of Sciences (Stockholm).

Of 30 species originally described as new by Linnaeus in 1764 and present, at the time, in the private museum of Queen Ludovica Ulrika, only 5 were found by Thunberg (1804), Aurivillius (1882) or Wallin (2001), but the type materials of only four of them are still present in UUZM (Table 1). However, although none of these species was illustrated by Clerck (1759, 1764) in his published 'Icones', Aurivillius (1882) mentions that pictures of *Papilio clytus*, *P. cassus*, *P. tulbaghia*, *P. niso* and *P. protumnus* are included in the unpublished 'Sectio Tertia' of C. A. Clerck's Icones Insectorum.

Thanks to the photographs of Linnaeus' materials (https://linnean-online.org/) and of the Royal Swedish Academy of Sciences (Stockholm), we are now able to reproduce here (Figs 1, 2) the lectotypes of the above mentioned five species (designated by Honey and Scoble 2001), next to Clerck's relevant 'icona', to permit the direct comparison between Clerck's illustrations and pictures of the actual specimens. In this respect, apart from the setting of specimens and of many details such as wing spotting etc., it is also interesting to observe that the name 'protumnus' is misspelled as 'prolumnus' both in the LSL specimen and in the caption of Clerck's unpublished picture (Fig. 1 bottom) (see also Honey and Scoble 2001).

Linnaeus' collection

As we have seen, most (81%) of the species listed in 1764 as part of the Queen's collection had been already described in Linnaeus' previous works (1758, 1763). Yet, specimens of only 61 (47%) of these species had been listed as present in that collection (cited as "M. L. U." in their original descriptions), whilst the origin of the others remained unstated, so that they may well have been based on materials from Linnaeus' own collection.

Table 1. List of the 30 butterfly species published as new by Linnaeus (1764). Columns to the right respectively refer to whether each species was mentioned by Thunberg or Wallin as present at UUZM; species illustrated in Clerck's unpublished 'Icones' (see Figs 1, 2), including the page where each species was mentioned (and figured); and the page where further indications on each species can be found in Aurivillius (1882) and Honey and Scoble (2001); list of the syntypes or lectotypes recognised or designated by Honey and Scoble (2001) and preserved in UUZM and/or LSL (see also the main text).

#	Linné 1764	page	no.	Thunberg 1804 p.	Clerck unpubl.	Wallin [1994] p.	Aurivillius 1882 p.	H. & S. page	UUZM	LSL
1	*P. horta*	234	53	8	-	34	50	332	LT	ST
2	*P. mopsa*	235	54	-	-	-	50	351	-	-
3	*P. monuste*	237	56	-	-	-	51	351	-	-
4	*P. pyrene*	241	60	-	-	-	54	375	-	LT
5	*P. helice*	243	62	-	-	-	56	330	-	LT
6	*P. hyperbius*	257	76	8	(? sp.)	30 (? sp.)	66	334	-	-
7	*P. misippus*	264	83	-	-	-	71	350	-	LT
8	*P. clytus*	268	87	-	yes	-	76	313	-	LT
9	*P. cassus*	269	88	-	yes	-	77	309	-	LT
10	*P. briseis*	276	94	-	-	-	81	306	-	LT
11	*P. hedonia*	279	97	-	-	-	84	329	-	-
12	*P. phaedra*	280	98	-	-	-	85	361	-	LT
13	*P. hermione*	281	99	-	-	-	86	331	-	LT
14	*P. deianira*	282	100	-	-	29	87	317	not ST	?ST
15	*P. tulbaghia*	284	102	-	yes	-	88	389	-	LT
16	*P. janassa*	294	112	-	-	-	95	338	-	-
17	*P. nesaea*	302	120	-	-	-	101	353	-	LT
18	*P. prorsa*	303	121	-	-	-	101	372	-	-
19	*P. camilla*	304	122	-	-	-	102	307	-	-
20	*P. thespis*	318	136	-	-	-	110	386	-	LT
21	*P. lara*	320	138	-	-	-	111	341	-	LT
22	*P. metis*	325	143	9	-	37	114	349	ST	LT
23	*P. thero*	328	146	-	-	-	116	385	-	LT
24	*P. thyra*	329	147	-	-	-	116	387	-	LT
25	*P. thysbe*	330	148	-	-	-	117	387	-	LT
26	*P. zeuxo*	331	149	9	-	38	118	393	ST	LT
27	*P. pitho*	337	155	-	-	-	123	367	-	LT
28	*P. spio*	338	156	9	yes	37	124, fig. 3	381	ST	LT
29	*P. niso*	339	157	-	yes	-	125, fig. 4	355	-	LT
30	*P. protumnus*	340	158	-	yes	-	126	374	-	LT

When Carl Linnaeus died (in 1778), his collections, library, manuscripts and correspondence passed on to his son Carl Linnaeus the Younger. After the death of the latter (1783), the widow and daughter offered for sale all Linnean materials to Sir Joseph Banks, who declined the offer but urged his student and friend James Edward Smith, son of an affluent wool merchant, to make the purchase. Smith managed to convince his father to provide the required 1000 guineas and the collection finally arrived in London, in 1784.

Smith did not keep Linnaeus' materials for himself and housed it in the premises of the Linnean Society of London (LSL), newly founded by him in 1788, together with Samuel Goodenough and Thomas Marsham (the world's oldest biological society). He also became its first President and held this position until his death (1828) (Kennett 2016).

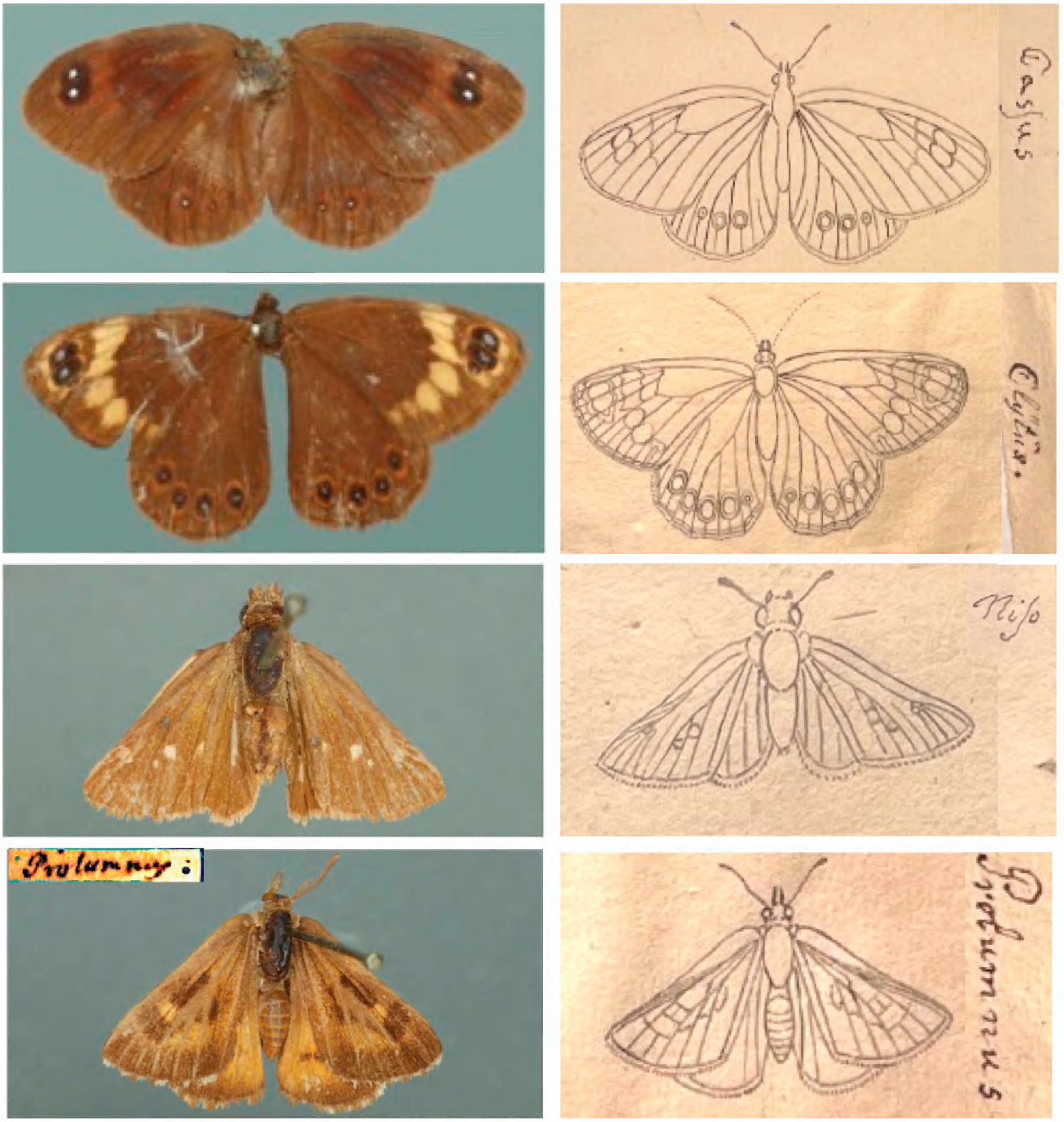

Figure 1. Top to bottom: *Papilio cassus*, *P. clytus*, *P. niso* and *P. protumnus*. Please observe that the name [*Papilio*] *protumnus* is misspelled as '*prolumnus*' both in the caption to Clerck's figure and on the pin label of the lectotype of this species, here pasted on the photography of the LT designated by Honey and Scoble (2001).

Lectotypifications

In more recent times, authors began to designate the lectotypes of some of these species (Hemming 1964; Kudrna 1977; Mielke 1989), often following Aurivillius' (1882) indications and occasionally with variable fortunes.

Honey and Scoble (2001), while reviewing Linnaeus' butterflies, designated 152 lectotypes, 101 of which typify species described by Linnaeus (1764). All are preserved in the collections of either UUZM (57), or LSL (44). Although not explicitly stated, the rationale for this action was that even

Figure 2. Above the lectotype (left) and Clerck's illustration of *P. tulbaghia* (right). Below: Clerck's coloured 'Icones' of *P. protumnus* (left) and *P. niso* (right). The latter was reproduced also by Aurivillius (1882, pl. 1) and Honey and Scoble (2001). Comparing these with the line drawings on Fig. 1 shows that Clerck used to add some details only during colouring.

in the absence of any direct evidence, it may be possible that some of the syntypes were either i) already present in Linnaeus' collection (p. 285), or ii) inadvertently remained among the Linnean materials purchased by J. E. Smith (the lectotypes of all the LSL specimens carry both Linnaeus' and Smith's labels) (see above and Figs 1, 2).

None of these designations, so far as we could gather, was seriously challenged by later authors, apart from the single case below.

The case of *Papilio hermione*

In his revision of the genus *Hipparchia*, the late Otakar Kudrna (1977) designated as lectotype of *Hipparchia hermione* (L) a specimen (arguably a syntype, bearing the label "hermione" in Linnaeus' hand), of the species otherwise known as *H. alcyone* ([Denis & Schiffermüller], 1775). The effect of this action was that the butterfly formerly known as *H. alcyone* had to be renamed *H. hermione*, whilst the latter name had to be removed from the synonymy of *H. fagi* (Scopoli, 1763).

Several authors, including Higgins and Riley (1978), Koçak (1983), Jutzeler (2021) and Russell and Vane-Wright (2022) tried to restore the previous and long established (although surely not universal) usage, rejecting Kudrna's lectotypification as invalid, but implicitly thereby affecting all other such actions by Honey and Scoble (2001) and most previous authors.

More in detail, authors argued that:

1. Pinned labels showing the species name and not accompanied by any collection data have no nomenclatural status, since labels can be moved.
2. *H. hermione* is synonym of *H. fagi* since Linnaeus was first to acknowledge this in several occasions.
3. "There is no credible evidence to suggest that any of the *Hipparchia* specimens in the Linnaean Society of London collection could have come from Queen Ulrika's collection" (Russell and Vane-Wright's (2022 p. 285).

Based on these arguments, Russell and Vane-Wright (2022) went as far as to designate a specimen preserved in the NHMUK as neotype of both *Papilio fagi* Scopoli, 1763 and *P. hermione* Linnaeus, 1764 which, following Kudrna (1977) would otherwise represent two separate species.

Attempts for returning to the long-established former usage are appreciable and reasons underpinning them can be shared, but the logic calling for this action needs to be analysed in more detail, most particularly so because, as we have seen, all of these contentions do not truly relate to a specific case, but have important and general nomenclatural implications.

Contention #1, taken alone, would invalidate at least most of the lectotypes designated in Linnaeus', Fabricius' and Cramer's (etc.) entomological collections over the years, thereby creating havoc in current insect taxonomy. Taking such a restrictive stance over the issue of recognising historical specimens as syntypes would make it necessary to designate a very large number of neotypes. Making such a decision can be possible, but only in case that the issue is discussed and accepted by the entire zoological community, and surely not by inserting a sentence in passing, within in a paper.

Contention #2 is as easily dismissed. Linnaeus' importance as a taxonomist cannot be questioned, but synonymies or references cited under his descriptions are not particularly famous. Even in the case of *P. hermione*, he cited the illustrations of Petiver (representing *Hipparchia fidia*) and Rösel (*Brintesia* [or *Kanetisa*] *circe*).

Contention #3 is definitely the most important and requires some deliberation, because it is based on a misconception.

The ICZN states (reported verbatim):

"**Article 74. Name-bearing types fixed subsequently from the type series (lectotypes from syntypes)**

74.1. **Designation of a lectotype**

A lectotype may be designated from syntypes to become the unique bearer of the name of a nominal species-group taxon and the standard for its application (except in the case of hapantotypes [Art. 73.3]).

74.1.1. The valid designation of a lectotype fixes the status of the specimen as the sole name-bearing type of that nominal taxon; no later designation of a lectotype has any validity.

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74.2. **Lectotype found not to have been a syntype**

If it is demonstrated that a specimen designated as a lectotype was not a syntype, it loses its status of lectotype."

In other words, once a lectotype has been designated, it can be invalidated only by demonstrating that it is not part of the type series. All 'convincing evidence' is therefore to be offered by the invalidator, who carries the burden of proof.

In contrast, as concerns this case, we argue that available evidence strongly suggests that some of Linnaeus' (1764) original materials were moved from Queen Ludovica Ulrika's personal Museum to what is now the collection of the LSL. Of course, this does not necessarily mean that the same applies to all the other 'missing' lectotypes, but since it cannot be demonstrated that the lectotype of *Papilio hermione* Linnaeus, 1764 designated by Kudrna (1977) was not a syntype (Art. 74.2, above), it remains valid.

Likewise, the specimen designated by Russell and Vane-Wright (2022) cannot represent the valid neotype of *P. hermione* (Art. 74.1.1, above).

In conclusion, we wish to emphasize that anyone wishing to reinstate the pre-1977 usage of the name *P. alcyone* ([Denis & Schiffermüller], 1775) should submit an application to ICZN, asking to designate a neotype, and to set aside all previous designations of type specimen. The Commission represents in fact the only body capable of suspending the Code, in scope of its plenary powers.

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